of thorium. The first stage which deploys pressurised heavy water reactors and produces power and plutonium has attained commercial maturity. India has desigend and constructed its own pressurised heavy water reactors and also the associated fuel cycle facilities plants based on Technologies developed in the Bhabha Atomic Research Centre with the corporation of Indian industries. The second stage comprising development of fast broader reactors is at the demonstration phase. An experimental reactor is operational in the Indira Gandhi Centre for Atomic Research it Salpakkam' with indigenously developed ∴ ici of mixed carbide of uranium and Plutonium. The technology with respect of the third stage, namely, utilisation of thorium is in experimental stage, with the commissioning of the indigenously tesigned KAMINI which utilises uranium-233 fuel.

(c) Apart from generation of eiectricity, the programme covers beneficial uses of atomic energy in the fields of medicine, agriculture and industry.

(d) Continuous development in all parts of the nuclear fuel cycle, including the design of an Advanced Heavy Water Reactor and the Prototype Fast Breeder Reactor and other related areas of accelerators and lasers is in progress**.**

Development of Desalination Technologies by BARC

2722. SHRI SURINDER KUMAR SINGLA:
DR. SHRIKANT RAMCHANDRA JICHKAR:

Will the PRIME MINISTER be pleased to state:

(a) what have been the results of the two-decade long work of BARC in the area of desalination technologies;

(b) whether any development in these areas has taken place due to the above work;

(c) whether any pilot projects were undertaken;

(d) if so, the results thereof; and

(e) the works being undertaken in this field?

THE MINISTER OF STATE OF THE MINISTRY OF PLANNING AND PROGRAMME IMPLEMENTATION AND MINISTER OF STATE OF THE MINISTRY OF SCIENCE AND TECHNOLOGY (SHRI YOGINDER K. ALAGH): (a) As a result of two decades of Research and Development (R&D) work on desalination at the Bhabha Atomic Research Centre (BARC) it has been now possible to develop desalination technology in the country to provide safe potable water in brackish water areas.

(b) Yes, Sir. The technology of reverse osmosis (membrane process) and multi stage flash (evaporation process) have been successfully developed.

(c) Yes, Sir. A number of pilot projects were undertaken on both the technologies. These are (i) 425 M^3/Day MSF plant for sea water desalination, (ii) 30T/D shipborne desalination plant, (iii) 50 M^3/D RO effluent treatment plant and (iv) 15M^3/D RO pilot plant for producing ultra pure water.

Two numbers of S0ra^3/D RO giants were set up in eighties in the villages of Andhra Pradesh and Gujarat for studying the feasibility of providing safe potable water from available brackish sources.

(d) The successful operation of 425M^3/D MSF plant has provided useful data for design and fabrication of commercial size plant. The 30 T/D shipborne desalination plant utilises low temperaure evaporation and can be used on waste beat sources thus saving energy. The RO plants are capable of converting brackish water into safe potable water. These are also useful for water and effluent water treatment for water reuse.

(e) Based on experience gained from our R&D work, a 6300 M^3/Day

combined MSF-RO desalination plant has been designed. It will utilise low pressure steam and is proposed to be set up at kalpakkam under the IX Plan subject to availability of funds. This plant will prove our indigenous capability of setting up large scale nuclear desalination plants in future.

Improvement in Nuclear Power Stations

2723. SHRI PREM CHAND GUPTA: Will the PRIME MINISTER be pleased to state:

(a) whether there has been any improvement in the serviceability and output of our nuclear power stations; and

(b) if so, what is the latest status?

THE MINISTER OF STATE OF THE MINISTRY OF PLANNING AND PROGRAMME IMPLEMENTATION AND MINISTER OF STATE OF THE MINISTRY OF SCIENCE AND TECHNOLOGY (SHRI YOGINDER K. ALAGH): (a) and (b) Yes, Sir. concerted efforts have been made to improve the performance of the nuclear power plants and as a result, the performance has improved over the past two years. During 1995-96, NPCIL generated 7982 Million Units of electricity against annual target of 7950 MUs, achieving an overall annual capacity factor of 60%. During 1996-97, upto the end of February 97, 8166 MUs have been generated, 9000 MUs are expected to be generated during the whole year against the target of 7570 MUs. This would mean an annual capacity' factor of 66%. The new generating units, namely, Narora Atomic Power Station and Kakrapar Atomic Power Station have achieved a capacity factor of 85% and 71% respectively during the year 1996-97 so far. Two reactors namely, Rajasthan Atomic Power Station (RAPS) units-1 & 2 are currently under shut down. RAPS unit-1 which is the first pressurised heavy water reactor in India, commissioned in 1972, has been shut down since February 1994 due to a minor out difficult-to-repair leak from the Over Pressure Relief Device (OPRD). The leak has been successfully repaired and the unit is expected to be back in operation shortly. RAPS unit-2 which has performed well during its commercial operation since April, 1981 upto July, 1994 and achieved a life time plant Load Factor of 60%, has been shut down since August, 1994 for an masse coolant channel replacement and upgradation of systems. These works are in the nature of capital maintenance which are progressing satisfactorily. RAPS-2 is expected to be brought back into operation during 1998. With the re-commissioning of these 2 units, a further generating capacity of 300 MWe would be added.

Gamma Sterilization Plants

2724. SHRI JAGIR SINGH DARD: Will the PRIME MINISTER be pleased to state:

(a) how are the Gamma Sterilization Plants doing in our country;

(b) the number of such plants and where they are located;

(c) whether their output cater to the demand; and

(d) the other steps being taken in this area?

THE MINISTER OF STATE OF THE MINISTRY OF PLANNING AND PROGRAMME IMPLEMENTATION AND MINISTER OF STATE OF THE MINISTRY OF SCIENCE AND TECHNOLOGY (SHRI YOGINDER K. ALAGH): (a) and (b) There are three gamma sterilization plants in the Country.

(i) 'Isomed' plant under Board of Radiation & Isotope Technology (BRIT), located at Trombay, Mumbai;

(ii) 'RASHMP Radiation Sterilization Plant at Kidwai Memorial Institute of Oncology, Bangalore; and